

Adaptive Optics Systems

Low-cost adaptive-optics systems for wavefront correction

The Isotope Separation and Advanced Manufacturing (ISAM) Technologies program at LLNL has developed adaptive-optics systems to correct wavefront errors in optical systems. With these systems, we have corrected wavefront errors generated by our high-power dye lasers in the industrial setting of uranium-isotope-enrichment demonstrations.

Compared to state-of-the-art deformable mirrors now used for atmospheric compensation, our low-cost mirrors require fewer actuators and operate at lower bandwidths. In addition, the dielectric coatings developed for our ISAM dye lasers have such low absorptions that no substrate cooling is required. All of our current deformable mirror designs are built with a monolithic ULE substrate, and use from 19 to 127 low-voltage actuators. Closed-loop control of the wavefront is achieved with feedback from Hartmann-Shack



AVLIS 60-actuator plant-scale deformable mirror.

APPLICATIONS

- Low-cost, adaptive-optics systems for wavefront corrections
- Permits diffraction-limited performance from high-power laser systems

wavefront sensors. These systems are needed to obtain diffraction-limited performance from high-power laser systems.

Besides isotope-separation applications, our adaptive-optics systems are being used in LLNL's Laser Guide Star

and Inertial Confinement Fusion (ICF) projects. A system is also being tested in LLNL's Laser Materials Processing Facility.

Availability: This technology is available now. LLNL is looking for industrial partners with whom to further develop and apply these adaptive optics systems.

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